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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/595,434	04/19/2006	Siegfried F. Karg	CH920030009US1	9566
33074 7590 12/24/2009 INTERNATIONAL BUSINESS MACHINES CORPORATION DEPT. 18G BLDG. 321-482 2070 ROUTE 52 HOPEWELL JUNCTION, NY 12533				
EXAMINER HORNING, JOEL G				
ART UNIT		PAPER NUMBER		
1792				
NOTIFICATION DATE		DELIVERY MODE		
12/24/2009		ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

EFIPLAW@US.IBM.COM

### Office Action Summary

**Application No.**

10/595,434

**Applicant(s)**

KARG ET AL.

**Examiner**

JOEL G. HORNING

**Art Unit**

1792

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 October 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) 1-9 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 10-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SI/22)
- 4) ☐ Interview Summary (PTO-413)
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date 04-26-2006; 06-16-2009

## **DETAILED ACTION**

### ***Election/Restrictions***

1. **Claims 1-9** are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on October 22<sup>nd</sup>, 2009. The restriction is based upon Unity of Invention rules, since the application is a national stage application.

The basis for applicant's traversal is that there are more common technical features that link the apparatus and the method claims which were not found in the applied reference. These features are the presence of a precursor vapor in the apparatus and an electromagnetic field strong enough to decompose the vapor.

However, MPEP 2114 states: "Expressions relating the apparatus to contents thereof during an intended operation are of no significance in determining patentability of the apparatus claim." Ex parte Thibault, 164 USPQ 666, 667 (Bd. App. 1969). Furthermore, "[i]nclusion of material or article worked upon by a structure being claimed does not impart patentability to the claims." In re Young, 75 F.2d 996, 25 USPQ 69 (CCPA 1935) (as restated in In re Otto, 312 F.2d 937, 136 USPQ 458, 459 (CCPA 1963)). The precursor vapor and the radiation present in the apparatus while performing a particular process are not patentably significant to apparatus claims, so they are not common technical features shared by both groups. The restriction is maintained.

### ***Claim Objections***

- 2.
3. **Claim 10** is objected to because of the following informalities: on line 6 of the claim applicant recites "extend" when they most certainly meant "extent." Appropriate correction is required.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
  2. Ascertaining the differences between the prior art and the claims at issue.
  3. Resolving the level of ordinary skill in the pertinent art.
  4. Considering objective evidence present in the application indicating obviousness or nonobviousness.
4. **Claims 10-15** are rejected under 35 U.S.C. 103(a) as being unpatentable over Yau et al (Applied Physics Letters **57** (1990), No 27, pp 2913-2915, as provided by applicant) in view of Asahino et al (Physical Review Letters **86** (2001) No 19, pp 4334-4337) in view of Jersch et al (Applied Physics A **64** (1997) pp 29-32, as supplied by applicant).

As shown in figure 1, Yau et al teaches a method for patterning a substrate that is beneath an STM probe tip. A vapor of trimethylaluminum (**TMA, claim 11**) supplied near the probe tip and a lens is used to focus the laser beam (**claim 14**) at the probe tip to the desired intensity so that the TMA decomposes into ions there. It is readily apparent from the description that the light intensity in some places will not great enough to decompose the TMA vapor. These ions are guided by the STM tip electric field to the substrate surface, where they deposit the material. Yau et al then uses the STM tip to image the deposited material (page 2913). Yau et al does not teach using an AFM probe tip.

However, Asahino et al teaches that for imaging it is beneficial to use STM and AFM simultaneously in order to obtain information on both the electronic states and the topography of the substrate surface (abstract). It teaches doing this by using a probe tip that is a conductive ( $n^+$  silicon) AFM/STM tip with a bias, so the tunneling current can be measured simultaneously with the force measurements on the tip (page 4334, right column).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use an AFM/STM system in the process of Yau et al in order to be able to simultaneously obtain topographic information about the substrate when imaging the substrate afterwards.

Yau et al does not teach using the probe tip to intensify the laser, instead it uses a lens.

However, Jersch et al teaches that with sharp scanning force microscopy tips, such as STM or AFM tips, it is possible to focus laser radiation at the probe tip by using a FOLANT technique, where the sharpness of the probe tip itself is used to focus the laser to a higher intensity at the tip of the probe (page 29, introduction section).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use a FOLANT technique, as taught by Jersch et al, to focus the laser at the probe tip so that the TMA will decompose there, instead of using the lens taught by Yau, since it was another known method for focusing a laser beam near an AFM or STM probe tip, which would be expected to produce predictable results (**claim 10**).

5. Regarding **claim 12**, Jersch et al teaches that the laser beam polarization should be parallel to the long (longitudinal) axis of the probe tip (axis  $a > b$ ) (page 30, right column).
6. Regarding **claim 13**, Jersch et al further teaches that the field enhancement (amplification) of the light due to the FOLANT ( $|g|^2$ ) is a function of the wavelength (optical frequency) of the laser light used (page 31, left column, equation 1).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to control the laser frequency in order to produce the desired amplification level to decompose the TMA with the probe tip used since it was a variable which was known to affect the amplification level and would produce

predictable results. Since the probe tip has a size, the wavelength of the light is adapted to match the size of the probe tip used.

7. Regarding **claim 15**, Yau et al in view of Asahino et al in view of Jersch et al discloses the claimed invention except for using multiple probe tips. It would have been an obvious matter of design choice to use multiple tips, since it has been held that mere duplication of the essential working parts of a device involves only routine skill in the art. *St. Regis Paper Co. v. Bemis Co.*, 193 USPQ 8.
8. **Claim 15** is alternatively rejected under 35 U.S.C. 103(a) as being unpatentable over Yau et al (Applied Physics Letters **57** (1990), No 27, pp 2913-2915, as provided by applicant) in view of Asahino et al (Physical Review Letters **86** (2001) No 19, pp 4334-4337) in view of Jersch et al (Applied Physics A **64** (1997) pp 29-32, as supplied by applicant) further in view of Mirkin et al (US 20020063212).
9. Yau et al in view of Asahino et al in view of Jersch et al does not teach using multiple probe tips at the same time for the deposition process.
10. However, Mirkin et al is also directed towards a process of depositing layers of material using AFM tips as the deposition source (abstract). It teaches using multiple AFM tip arrays for the deposition process in order to enable depositing material from multiple tips simultaneously, resulting in a process where "both imaging and patterning speeds could be dramatically improved" [0185].
11. Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use multiple tips at the same time in order to dramatically improve the imaging and patterning speeds of the process (**claim 15**).

12. **Claim 16** is rejected under 35 U.S.C. 103(a) as being unpatentable over Yau et al in view of Asahino et al in view of Jersch et al as applied to claim 15 above, further in view of Takahashi et al (Ultramicroscopy **82** (2000), pp 63-68).

In the Yau et al in view of Asahino et al in view of Jersch et al rejection, as discussed previously, Asahino et al teaches using an AFM probe that is conductive so that a bias can be applied to the tip, so a tunneling current can be produced for the STM measurements. It specifically teaches using a doped silicon probe for this purpose, not a metallized one.

However, Takahashi et al is also directed towards using a conductive AFM tip (abstract), it teaches that an AFM probe tip can be made conductive by coating it with a metal (e.g. Au or Co, page 64, experimental section).

Thus it would have been obvious to a person of ordinary skill in the art at the time of invention to use a metal coated AFM tip instead of a heavily doped AFM tip as another known method for forming a conductive AFM probe tip, which would produce predictable results.

### ***Conclusion***

13. No current claims are allowed.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOEL G. HORNING whose telephone number is (571) 270-5357. The examiner can normally be reached on M-F 9-5pm with alternating Fridays off.



If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael B. Cleveland can be reached on (571)272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J. G. H./  
Examiner, Art Unit 1792

/Michael Cleveland/  
Supervisory Patent Examiner, Art Unit 1792